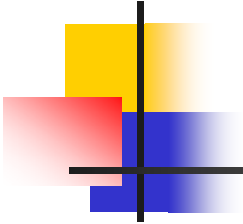




On- and Off-road Ethanol Emission Impacts

California Air Resources Board
PTSD Mobile Source Analysis Branch
Analysis Section
Offroad Modeling Section

Presentation Outline



- Addition of 2015 and 2020 Results
- Offroad Emission Estimates
 - Discussion of Offroad Methodology
- Emissions from portable gas cans
 - Not including emission estimates
 - Will discuss test result



Ethanol Effect on Cal 8-h Profile

- About 10% higher than Fed 8-h temp profile
- Most of effects from Diurnal and Resting
- Effects falling rapidly with calendar year



Ethanol Effect Cal 8-h 2015

Statewide 2015 Cal 8-h mtbe etoh

Vehicles	no	34,177,779
VMT/1000	kmi/d	1,219,000
Trips	no/d	228,819,925
Gasoline	kgal/d	65,171
Diesel	kgal/d	11,395

Total Ex	tpd	217.8	217.7
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Diurnal	tpd	55.8	63.1	7.2
Resting	tpd	31.3	38.7	7.5
Diurnal+Resting	g/d/veh	2.1	2.5	0.4
Running	tpd	170.8	173.9	3.0
Hot Soak	tpd	49.2	50.9	1.7

Total Evap	tpd	307.2	326.6	19.4
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Statewide 2015 Fed 8-h mtbe etoh

Vehicles	no	34,177,779
VMT/1000	kmi/d	1,219,000
Trips	no/d	228,819,925
Gasoline	kgal/d	64,091
Diesel	kgal/d	11,395

Total Ex	tpd	216.3	216.3
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Diurnal	tpd	51.7	58.1	6.4
Resting	tpd	28.9	35.5	6.7
Diurnal+Resting	g/d/veh	2.0	2.3	0.3
Running	tpd	169.0	171.6	2.6
Hot Soak	tpd	47.4	48.8	1.5

Total Evap	tpd	296.9	314.1	17.2
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June 30, 2006



Ethanol Effects Cal 8-h 2020

Statewide 2020 Cal 8-h mtbe etoh

Vehicles	no	36,851,166
VMT/1000	kmi/d	1,318,460
Trips	no/d	245,275,687
Gasoline	kgal/d	70,079
Diesel	kgal/d	13,155

Total Ex	tpd	147.7	147.7
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Diurnal	tpd	47.4	52.2	4.8
Resting	tpd	28.3	33.7	5.4
Diurnal+Resting	g/d/veh	1.7	2.0	0.2
Running	tpd	145.7	148.0	2.3
Hot Soak	tpd	42.4	43.5	1.1

Total Evap	tpd	263.7	277.4	13.7
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Statewide 2020 Fed 8-h mtbe etoh

Vehicles	no	36,851,166
VMT/1000	kmi/d	1,318,460
Trips	no/d	245,275,687
Gasoline	kgal/d	68,904
Diesel	kgal/d	13,155

Total Ex	tpd	146.8	146.8
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Diurnal	tpd	44.0	48.2	4.2
Resting	tpd	26.3	31.1	4.9
Diurnal+Resting	g/d/veh	1.6	1.8	0.2
Running	tpd	144.0	146.1	2.1
Hot Soak	tpd	41.0	42.0	1.0

Total Evap	tpd	255.3	267.5	12.2
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June 30, 2006



Ethanol Effects Cal 8-h SCAB

South Coast 2015 Cal 8-h					South Coast 2015 Fed 8-h				
		mtbe	etoh				mtbe	etoh	
Vehicles	no	13,460,210			Vehicles	no	13,460,210		
VMT/1000	kmi/d	482,021			VMT/1000	kmi/d	482,021		
Trips	no/d	91,544,843			Trips	no/d	91,544,843		
Gasoline	kgal/d	25,383			Gasoline	kgal/d	24,964		
Diesel	kgal/d	2,835			Diesel	kgal/d	2,835		
Total Ex	tpd	77.3	77.3		Total Ex	tpd	77.1	77.1	
Diurnal	tpd	16.3	18.2	1.9	Diurnal	tpd	15.1	16.9	1.7
Resting	tpd	11.3	13.9	2.6	Resting	tpd	10.4	12.7	2.3
Diurnal+Resting	g/d/veh	1.7	2.0	0.3	Diurnal+Resting	g/d/veh	1.6	1.9	0.3
Running	tpd	64.4	65.2	0.9	Running	tpd	63.8	64.6	0.8
Hot Soak	tpd	17.5	18.0	0.5	Hot Soak	tpd	17.0	17.4	0.4
Total Evap	tpd	109.5	115.4	5.9	Total Evap	tpd	106.3	111.5	5.2

June 30, 2006



Ethanol Effect Cal 8-h SCAB

South Coast 2020 Cal 8-h					South Coast 2020 Fed 8-h				
		mtbe	etoh				mtbe	etoh	
Vehicles	no	14,365,429			Vehicles	no	14,365,429		
VMT/1000	kmi/d	514,248			VMT/1000	kmi/d	514,248		
Trips	no/d	97,313,499			Trips	no/d	97,313,499		
Gasoline	kgal/d	26,916			Gasoline	kgal/d	26,467		
Diesel	kgal/d	3,191			Diesel	kgal/d	3,191		
Total Ex					Total Ex				
	tpd	52.4	52.4			tpd	52.2	52.2	
Diurnal	tpd	13.9	15.1	1.3	Diurnal	tpd	12.9	14.0	1.1
Resting	tpd	10.3	12.2	1.9	Resting	tpd	9.6	11.3	1.7
Diurnal+Resting	g/d/veh	1.4	1.6	0.2	Diurnal+Resting	g/d/veh	1.3	1.5	0.2
Running	tpd	55.4	56.1	0.7	Running	tpd	54.9	55.5	0.6
Hot Soak	tpd	15.4	15.7	0.3	Hot Soak	tpd	15.0	15.3	0.3
Total Evap					Total Evap				
	tpd	95.0	99.2	4.2		tpd	92.4	96.1	3.7



Off-Road Sources Data/Methodology

- 5 new lawnmowers tested with MTBE and ethanol fuel (5.95 vol %)
- Minute-by-minute test data over the certification temperature profile (65-105°F) for diurnal and resting losses
- Hot Soak tested at 95°F
- No running loss test data
- Gas cans tested (untreated/fluorinated/sulfonated)



Off-Road Sources Data/Methodology

- Lawn mower results used to apply to other offroad equipment
- Ethanol adjustment for equipment with metal tanks will be 30% less than equipment with plastic tanks



Off-Road Equipment Evaporative Ethanol Augmentation

Temperature Profile	Ethanol Augmentation
Summer Cert Std	1.38
Summer Average	1.27
Winter Average	1.19
Annual Average	1.24
Untreated Gas Can	1.54
Fluorinated Plastic Cans	1.82
Sulfonated Plastic Cans	1.28



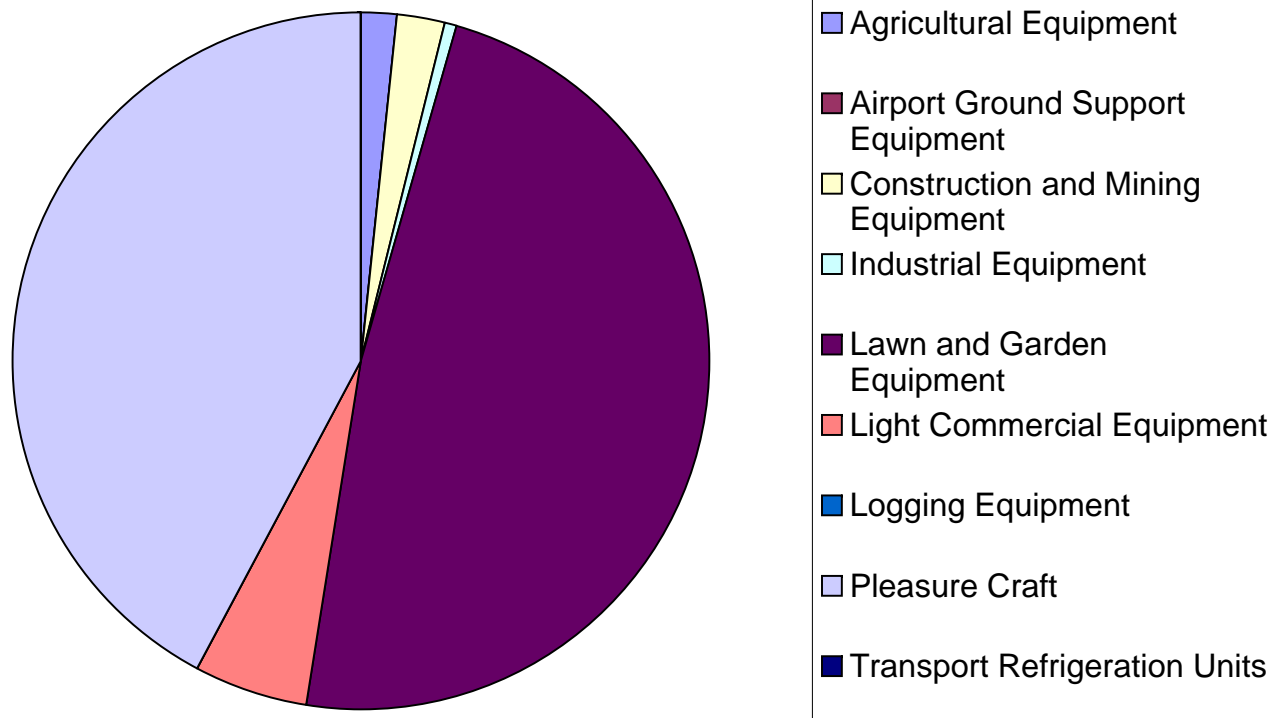
Off-Road Results (California 8 Hr Ozone, Summer Average)

Year	Area	Evap Emission (MTBE) Tons per day	Evap Emission (Ethanol) Tons per day	Difference Tons per day
2005	Statewide	121.1	158.2	37.1
2010	Statewide	105.7	139.6	33.9
2015	Statewide	94.3	125.8	31.5
2020	Statewide	88.8	120.5	31.7
2005	South Coast	45.1	57.9	12.8
2010	South Coast	38.2	49.5	11.3
2015	South Coast	33.1	43.3	10.2
2020	South Coast	30.8	40.8	10.0

Includes emissions from small and large off-road equipment and recreational marine engines.
Does not include gas cans.

Offroad Contributions to Evap

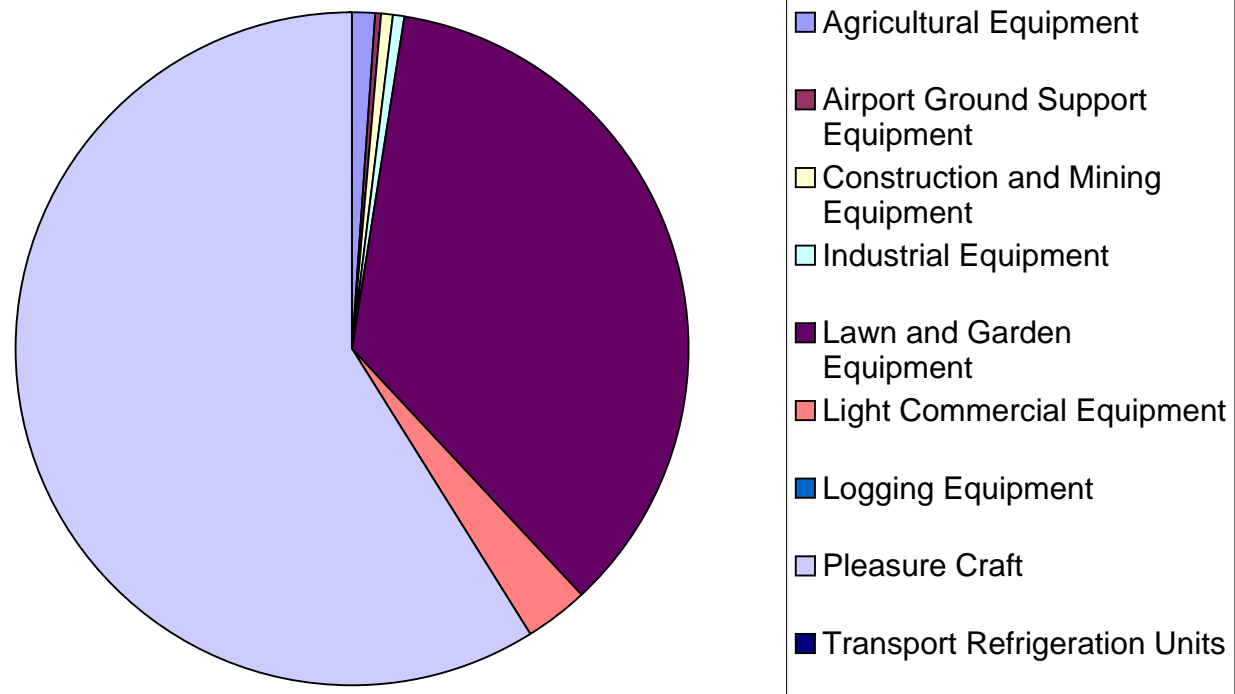
2005 Statewide



June 30, 2006

Offroad Contributions to Evap

2015 Statewide



June 30, 2006



Ethanol Effects

Statewide	EtOH Increase, tpd	Evap ROG tpd 2005	Percent of Evap
Onroad	40.4	435.5	9.3
Offroad	37.1	121.1	30.6
Total	77.5	556.6	13.9

South Coast	Ethanol Increase, tpd	Evap ROG tpd 2005	Percent of Evap
Onroad	13.1	160.5	8.2
Offroad	12.8	45.1	28.4
Total	25.9	205.6	12.6

Statewide	EtOH Increase, tpd	Evap ROG tpd 2010	Percent of Evap
Onroad	28.4	364.6	7.8
Offroad	33.9	105.7	32.1
Total	62.3	470.3	13.2

South Coast	EtOH Increase, tpd	Evap ROG tpd 2010	Percent of Evap
Onroad	8.7	129.2	6.8
Offroad	11.3	38.2	29.6
Total	20.0	167.4	12.0

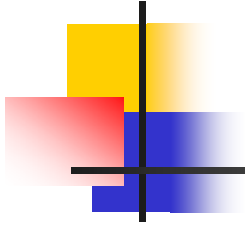
Does not include portable gas cans



Ethanol Effects

Statewide	EtOH Increase, tpd	Evap ROG tpd	Percent of Evap		Statewide	EtOH Increase, tpd	Evap ROG tpd	Percent of Evap
	2015					2020		
Onroad	19.4	307.2	6.3		Onroad	13.7	263.7	5.2
Offroad	31.5	94.3	33.4		Offroad	31.7	88.8	35.7
Total	50.9	401.5	12.7		Total	45.4	352.5	12.9
South Coast	EtOH Increase, tpd	Evap ROG tpd	Percent of Evap		South Coast	EtOH Increase, tpd	Evap ROG tpd	Percent of Evap
	2015					2020		
Onroad	5.9	109.5	5.4		Onroad	4.2	95.0	4.4
Offroad	10.2	33.1	30.8		Offroad	10.0	30.8	32.5
Total	16.1	142.6	11.3		Total	14.2	125.8	11.3

Does not include Portable Gas Cans



End of Presentation

Questions?